

**ACHARYA NAGARJUNA UNIVERSITY: NAGARJUNA NAGAR**

**SCHEME FOR COMPUTER SCIENCE & ENGINEERING  
w.e.f 2015-2016 (Semester System)**

**First Semester**

Code	Subject	T	P	C	SM	UEM
CSE 511	Advanced Data Structures	4	-	4	40	60
CSE 512	Data Base Management Systems	4	-	4	40	60
CSE 513	Computer Networks	4	-	4	40	60
	ELECTIVE -I	4	-	4	40	60
	ELECTIVE-II	4	-	4	40	60
	ELECTIVE-III	4	-	4	40	60
CSE 551	Data Structures Lab	-	3	2	40	60
CSE 552	DBMS Lab	-	3	2	40	60
	Total	24	6	28	320	480

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**SCHEME FOR COMPUTER SCIENCE & ENGINEERING  
w.e.f 2015-2016 (Semester System)**

**Second Semester**

Code	Subject	T	P	C	SM	USM
CSE 514	Data Engineering	4	-	4	40	60
CSE 515	Design Analysis of Algorithms	4	-	4	40	60
CSE 516	LINUX Programming	4	-	4	40	60
	ELECTIVE -IV	4	-	4	40	60
	ELECTIVE-V	4	-	4	40	60
	ELECTIVE-VI	4	-	4	40	60
CSE 553	Data Engineering Lab	-	3	2	40	60
CSE 554	LINUX Programming Lab	-	3	2	40	60
	Total	24	6	28	320	480

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**SCHEME FOR COMPUTER SCIENCE & ENGINEERING  
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**Third Semester**

Code	Subject	T	P	C	SM
CSE 711	Internship	--	--	2	100
CSE 712	Seminar	--	--	6	100
Total		--	--	8	200

**ACHARYA NAGARJUNA UNIVERSITY: NAGARJUNA NAGAR**

**SCHEME FOR COMPUTER SCIENCE & ENGINEERING  
w.e.f 2015-2016 (Semester System)**

**Fourth Semester**

Code	Subject	T	P	C	SM	UEM
CSE 713	Project Viva voce	--	--	16	50	150
Total		--	--	16	50	150

### Electives List

CSE 611E	Object Oriented Software Engineering	CSE 620E	Real Time Systems
CSE 612E	Artificial Intelligence	CSE 621E	Wireless Networks
CSE 613E	BIG Data	CSE 622E	Compiler Design
CSE 614E	Embedded Systems	CSE 623E	Mobile Application Development
CSE 615E	Network & Internet Security	CSE 624E	Digital Image Processing
CSE 616E	Software Project Management	CSE 625E	Distributed Systems
CSE 617E	Natural Language Processing	CSE 626E	Advanced Computer Architecture
CSE 618E	Network Programming	CSE 627E	Bio informatics
CSE 619E	Cloud Computing	CSE 628E	Multimedia Systems

## **CSE 511 ADVANCED DATA STRUCTURES**

**L T P M**

**4 0 0 100**

**(15 Periods)**

### **Unit- I. Non Linear data structures**

General Trees, Operations, Trees traversals, Binary Trees, Operations on binary trees, Conversion of a general tree to binary, Applications of trees, Heaps Graphs- multilink structures, representations, Graph traversals, Applications of graphs, spanning trees

### **Unit- II. Sorting**

**(15 Periods)**

Growth of function, -'O' notation, Complexity of algorithm, Classification, Internal sorting, Insertion sort, Selection sort, Shell sort, Tree sort, Selection sort, Bubble sort, Quick sort, Heap sort, External sorting, Multi way merge.

### **Unit- III. Searching**

**(20 Periods)**

Sequential search, Binary search, Search trees traversals, Binary trees, Inserting and deleting nodes in a binary search tree, Balancing binary search tree, Height balanced(AVL) tree: Concept and construction. Hashing Techniques, Hash function, Address calculation techniques, common hashing functions. Collision resolution. Linear probing, Quadratic Double hashing. Bucket addressing. Deletion and rehashing.

### **Unit- IV. Indexed structures**

**(20 Periods)**

Binary search trees as indexes m-way search tree: insertion, deletion, performance B-Treesearching, insertion, deletion, performance. Overview of B\*- Trees and B+-Trees Random files, Multi key files Organization, multikey access, inverted file organization. Alternate key ISAM. Comparison and trade-off. File design considerations.

#### **Text books:**

1. "Data Structures and Algorithm Analysis in C". Weiss, Mark Allen, Addison Wesley
2. "Data Structure . A Pseudocode Approach with C " \_\_Richard F. Gilberg, Bechrouz A. Forouzan (Thomson Learning)

#### **References:**

- 1."Introduction to data management and file design"-R.Kennith Walter,1986
- 2."An introduction to data structures with applications"-Trembley and Manohar
3. "Data Structure using C" AM Tanenbaum, Y Langsam and MJ Augenstein, Prentice-Hall, India, 1991.
4. "Data Structure and Program Design in C" . RL Kruse, BP Leung and CL Tondo, Prentice Hall, 1991.

## CSE 512 DATABASE MANAGEMENT SYSTEMS

L T P M  
4 0 0 100

### UNIT– I

(15 Periods)

**Databases and Database Users:** Introduction - An Example - Characteristics of the Database Approach - Actors on the Scene - Workers behind the Scene - Advantages of Using the DBMS Approach - A Brief History of Database Applications.

**Database System Concepts and Architecture:** Data Models, Schemas, and Instances - Three-Schema Architecture and Data Independence - Database Languages and Interfaces - The Database System Environment - Centralized and Client/Server Architectures for DBMSs

**Data Modelling Using the Entity-Relationship (ER) Model:** Using High-Level Conceptual Data Models for Database Design - An Example Database Application - Entity Types, Entity Sets, Attributes, and Keys - Relationship Types, Relationship Sets, Roles, and Structural Constraints - Weak Entity Types - Refining the ER Design for the COMPANY Database - ER Diagrams, Naming Conventions, and Design Issues.

### UNIT– II

(15 Periods)

**The Relational Data Model and Relational Database Constraints:** Relational Model Concepts - Relational Model Constraints and Relational Database Schemas - Update Operations, and Dealing with Constraint Violations

**The Relational Algebra:** Unary Relational Operations: SELECT and PROJECT - Operations from Set Theory - Binary Relational Operations: JOIN and DIVISION - Additional Relational Operations

**SQL-99: Schema Definition, Constraints, Queries, and Views:** SQL Data Definition and Data Types - Specifying Constraints in SQL - Schema Change Statements in SQL - Basic Queries in SQL - More Complex SQL Queries - INSERT, DELETE, and UPDATE Statements in SQL - Views (Virtual Tables) in SQL.

### UNIT– III

(15 Periods)

**Functional Dependencies and Normalization for Relational Databases:** Informal Design Guidelines for Relation Schemas - Functional Dependencies - Normal Forms Based on Primary Keys - General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form - Multivalued Dependencies and Fourth Normal Form - Join Dependencies and Fifth Normal Form.

**Introduction to Transaction Processing Concepts and Theory:** Introduction to Transaction Processing - Transaction and System Concepts - Desirable Properties of Transactions - Characterizing Schedules Based on Recoverability - Characterizing Schedules Based on serializability.

### UNIT– IV

(15 Periods)

**Concurrency Control Techniques:** Two-Phase Locking Techniques for Concurrency Control - Concurrency Control Based on Timestamp Ordering – Multiversion Concurrency Control Techniques - Validation (Optimistic) Concurrency Control Techniques - Granularity of Data Items and Multiple Granularity Locking.

**Database Recovery Techniques:** Recovery Concepts - Recovery Techniques Based on Deferred Update - Recovery Techniques Based on Immediate Update - Shadow Paging.  
Distributed DBMS Concepts and Design, Distributed DBMS-Advanced Concepts

**TEXT BOOK:**

1. "Fundamentals of Database Systems", RamezElmasri and Navate Pearson Education, 5<sup>th</sup> edition.
2. Database Systems: A practical approach to design, implementation and management-Thomas M Connolly and Carolyn E.Beggf (UNIT IV- Last two topics)

**REFERENCE BOOKS:**

1. "Introduction to Database Systems", C.J.Date Pearson Education.
2. "Data Base Management Systems", Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill, 3<sup>rd</sup>Edition.
3. "Data base System Concepts", Abraham Silberschatz, Henry.F.Korth, McGraw hill, 5<sup>th</sup> edition.

**UNIT – I****(15 Periods)**

**Introduction:** Reference Models- The OSI Reference model, The TCP/IP Reference model, The model used in this text, A comparison of the OSI and TCP/IP Reference model.

**The Data Link Layer:** Data link layer design issues, services provided to the network layer, framing, Error control, Flow control.

**Error detection and correction:** Error correcting codes, Error detecting codes.

**Elementary data link protocols:** A utopian simplex protocol, A simplex Stop-and-wait protocol for an error-free channel, A simplex Stop-and-wait protocol for a noisy channel.

**Sliding window protocols:** A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat.

**UNIT – II****(15 Periods)**

**Network Layer: Network Layer Design Issues:** Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service, Comparison of Virtual-Circuit & Datagram Networks.

**Routing Algorithms:** The Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing

**Congestion Control Algorithms:** Approaches to Congestion Control, Traffic-Aware Routing, Admission Control, Traffic Throttling.

**Quality of Service:** Application Requirements, Traffic Shaping, Packet Scheduling, Admission Control.

**The Network Layer in the Internet:** The IP Version 4 Protocol, IP Addresses, Internet Control Protocols: ICMP, ARP, DHCP.

**UNIT – III****(15 Periods)**

**The Transport Layer:** The Transport Service, Services Provided to the Upper Layers, Transport Service Primitives, Berkeley sockets

**Elements of Transport Protocols:** Addressing, Connection Establishment, Connection Release, Error Control and Flow Control, Multiplexing, Crash Recovery,

**The Internet Transport Protocol (UDP):** Introduction to UDP, Remote Procedure Call, The Real-Time Transport Protocol.

**The Internet Transport Protocols (TCP):** Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, Modeling TCP Connection Management, TCP Sliding Window, TCP Timer Management, TCP Congestion Control.



## UNIT – IV

(15 Periods)

**Application Layer: The Domain Name System(DNS):** The DNS Name Space, Domain ResourceRecords, Name Servers. **Electronic Mail:** Architecture & Services, The User Agent, Message Formats, Message Transfer, Final Delivery.

**The World Wide Web:** Architectural Overview, Static Web Pages, Dynamic Web Pages and Web Applications, HTTP – Hyper Text Transfer Protocol.

### Text books:

1. Andrew S. Tanenbaum, Computer Networks, Fifth Edition, Pearson Education.

### References:

1. James F.Kurose, Keith W.Ross, Computer Networking, Third Edition, Pearson Education
2. Behrouz A Forouzan, Data Communications and Networking, Fourth Edition, TMH (2007).
3. Kurose & Ross, **COMPUTER NETWORKS**, A Top-down approach featuring the Internet, Pearson Education, Alberto Leon, Garciak.

1. Write a C Program to implement the sorting techniques:
  - a) Selection sort
  - b) Bubble sort
  - c) Shell sort.
2. Write a C Program to implement the quick sort.
3. Write a C Program to implement the heap sort.
4. Write a C Program to implement the merge sort.
5. Write a C Program to implement the Binary Search Tree (BST) operations:
  - a) Insertion
  - b) Deletion
  - c) Searching
  - d) Traversal Techniques.
6. Write a C Program to implement the AVL Tree operations:
  - a) Insertion
  - b) searching
  - c) Traversal Techniques.
7. Write a C program to implement the Graph traversal technique Breadth First Search (BFS).
8. Write a C program to implement the Graph traversal technique Depth First Search (DFS).
9. Write a C program to implement the Minimal Spanning Tree using prim's algorithm.
10. Write a C program to implement the Minimal Spanning Tree using kruskal's algorithm.

DDL Statements

- Creating objects: tables and views.
- Altering the Schema of objects
- Dropping the objects

DML Statements

- Insert
- Delete
- Update

DCL Statements

- Grant
- Revoke
- Commit
- Rollback
- Savepoint

Simple queries: selection, projection, sorting on a simple table

- Small to large number of attributes
- Distinct output values
- Renaming attributes
- Computed attributes
- Simple-complex conditions (AND, OR, NOT)
- Partial Matching operators (LIKE, %, \_, \*, ?)
- ASC-DESC ordering combinations
- Checking for Nulls

Multi-table queries(JOIN OPERATIONS)

- Aliasing tables - Full/Partial name qualification
- Inner-joins (two and more (different) tables)
- Inner-recursive-joins (joining to itself)
- Outer-joins (restrictions as part of the WHERE and ON clauses)
- Using group by & having clauses

Nested queries

- In, Not In

- Exists, Not Exists
- Dynamic relations (as part of SELECT, FROM, and WHERE clauses)

#### Set Oriented Operations

- Union
- Difference
- Intersection
- Division

#### PL/SQL Programming

- Programs using named and unnamed blocks
- Programs using Implicit and Explicit Cursors
- Exception Handling
- Creating stored procedures, functions and packages
- Triggers and auditing triggers

Oracle Forms

Oracle Reports

### **LEARNING RESOURCES**

#### **TEXT BOOKS:**

1. Oracle Database 10g The Complete Reference by Kevin Loney, Tata McGraw-Hill Publishing Company Limited.
2. Oracle 9i PL/SQL Programming by Scott Urman, Tata McGraw-Hill Publishing Company Limited.
3. Simplified Approach to Oracle by Parteek Bhatia, Sanjiv Datta, Ranjit Singh, Kalyani Publishers.

## CSE 514 DATA ENGINEERING

L T P M

4 0 0 100

### UNIT- I

15 Periods

**Data Warehouse:** Data Warehouse: Basic Concepts, Data Warehouse Modelling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation.

**Getting to know Data:** Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Measuring Data Similarity and Dissimilarity.

**Data Mining:** What is Data Mining, Kinds of Data, Kinds of Patterns, Technologies Used, Major Issues in Data Mining.

### UNIT- II

15 Periods

**Data Preprocessing:** Data cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

**Mining Frequent Patterns, Associations, and Correlations:** Basic Concepts, Frequent Item set Mining Methods.

**Advanced Pattern Mining:** Mining Multilevel Associations, Mining Multidimensional Associations, Mining Quantitative Association Rules.

### UNIT- III

15 Periods

**Cluster Analysis:** Introduction to cluster analysis, partitioning methods, Hierarchical methods, Density-Based Methods: DBSCAN.

**Outlier Detection:** Outliers and Outlier Analysis, Outlier Detection Methods, Statistical Approaches, Proximity-Based Approaches.

### UNIT- IV

15 Periods

**Classification:** Basic Concepts: Basic Concepts, Decision tree induction, Bayes Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy.

**Classification:** Advanced Methods: Bayesian Belief Networks, Classification by Back propagation, Other Classification Methods.

#### TEXT BOOK:

1. *Data Mining Concepts & Techniques*, Jiawei Han, MichelineKamber, and Jian Pei, 3/e, Morgan Kaufmann Publishers.

#### REFERENCE BOOKS:

1. *Introduction to Data Mining*, Pang-Ning Tan, Michael Steinbach, and Vipin Kumar, Addison Wesley.

2. *Data Warehouse Toolkit*, Ralph Kimball, John Wiley Publishers.

## **CSE 515 DESIGN AND ANALYSIS OF ALGORITHMS**

**L T P M**  
**4 0 0 100**

### **UNIT I**

Introduction: Algorithm, Pseudo code for expressing algorithms, Performance Analysis- Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Probabilistic analysis, Amortized analysis. Disjoint Sets- disjoint set operations, union and find algorithms, spanning trees, connected components and biconnected components.

### **UNIT II**

Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

Greedy method: General method, applications-Job sequencing with dead lines, 0/1 knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

### **UNIT III**

Dynamic Programming: General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design.

Backtracking: General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

### **UNIT IV**

Branch and Bound: General method, applications - Travelling sales person problem, 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution. NP-Hard and NP-Complete problems: Basic concepts, non deterministic algorithms, NP- Hard and NP-Complete classes, Cook's theorem.

### **TEXT BOOKS :**

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Galgotia publications pvt. Ltd.
2. Algorithm Design: Foundations, Analysis and Internet examples, M.T. Goodrich and R. Tomassia, John Wiley and sons.

### **REFERENCES :**

1. Introduction to Algorithms, second edition, T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C. Stein, PHI Pvt. Ltd./ Pearson Education
2. Introduction to Design and Analysis of Algorithms A strategic approach, R.C.T. Lee, S.S. Tseng, R.C. Chang and T. Tsai, McGraw Hill.
3. Data structures and Algorithm Analysis in C++, Allen Weiss, Second edition, Pearson education.
4. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
5. Algorithms – Richard Johnson baugh and Marcus Schaefer, Pearson Education

## CSE 516 UNIX PROGRAMMING

L T P M  
4 0 0 100

(15 Periods)

### UNIT – I

**Introduction to UNIX:** UNIX Architecture, Features of UNIX.

**UNIX Internals:** Kernel Basics, File System, Process Management.

**The STREAM EDITOR (sed)** - Line addressing, multiple instructions, context addressing, writing selected lines to a file, text editing, substitution, Basic regular expressions.

**Programmable text processing: awk** – Sample awk filtering, splitting a line into fields, formatting output, variables and expressions, comparison operators, number processing, storing awk programs in a file, the BEGIN and END sections, Built-in Variables, arrays, functions, control structures, extended regular expressions.

### UNIT – II

(15 Periods)

**Bourne Shell programming:** Shell, functions of the shell, Meta characters, Input redirection, Output redirection, pipes, shell as programming language, shell variables, predefined local variables, predefined environment variables, Arithmetic, conditional expressions, control structures, positional parameters, passing command line arguments, Built – in Shell commands and shell programs, functions, arrays.

### UNIT-III

(15 Periods)

**File management system calls:** Regular file management system calls – open(), read(),write(), lseek(), close(), unlink(),stat(), getdents(). Miscellaneous file management system calls – chown() and fchown(), chmod() and fchmod(), dup() and dup2(),fcntl(), ioctl(), link(), mknod(), sync(), truncate() and ftruncate().

**Process Management:** Creating a new process – fork(),orphan processes, terminating a process – exit(), zombie processes, waiting for child – wait(), Differentiating a process – exec(), changing directories – chdir(), changing priorities- nice(), Accessing user and Group ID's.

### UNIT – IV

(15 Periods)

**Signals:** The defined signals, A list of signals, terminal signals, Requesting on Alarm signal – alarm( ), handling signals – signal( ), protecting critical code and chaining interrupt handlers, sending signals – kill( ), Death of children, suspending and Resuming processes, process Group's and control terminals.

**Inter process communication:** Pipes, Sockets, shared memory, semaphores.

### TEXT BOOK:

1. UNIX Concepts and Applications, Sumithabha Das, 4<sup>th</sup> edition, TATA McGraw Hill.
2. "UNIX for programmers and users", 3<sup>rd</sup> edition, Graham Glass, King Ables, Pearson education.

### REFERENCE BOOKS:

1. "The Design of UNIX operating System", Maurice J.Bach, PHI.
  2. "Advanced programming in the UNIX environment", W Richard Stevens, 2<sup>nd</sup> Edition, Pearson education.
  3. "UNIX programming environment", Kernighan and pike, Pearson education.
  4. "Your UNIX the ultimate guide",Sumitabha Das, TMH, 2<sup>nd</sup> edition.
- "Advanced UNIX programming", Marc J. Rochkind, 2<sup>nd</sup> edition, Pearson Education.

1. Compute all the cuboids of a data cube using SQL group-bys.
2. Compute all the cuboids of data cube using SQL Rollup and Cube operators.
3. Implement different OLAP operations using SQL
4. Design the data warehouse for the given schema.
5. Build the data warehouse for the given schema.
6. Consider a transaction database, Find frequent patterns by using a data mining tool.
7. Build a classifier for the given data set using a data mining tool.
8. Predict the value of a numeric attribute in the given data set using a data mining tool.
9. Consider an example data set and form clusters by using a data mining tool.



**LABCYCLE I: AWK Programming**

1. Design a command "**wishme**" that will greet you "goodmorning", "good afternoon" and "good Evening" according to current time.
2. Design a command "**verbosedate**" that displays day and month completely spelled.
3. Design a command "**fages**" that will list the files and their ages, to date.
4. Design a command "**word-freq**" that will print the words and number of occurrences of that word in the given text.
5. Design a command "**reminders**" that will print the events happening today, where events and their dates are edited in the file "events".
6. Design a command "**backwards**" that will print the words of a line in reverse order.
7. Design a command "**sales-totals**" that will consolidate the sales made by salespersons, from the file sales where each line contains the name of sales person and sales made.
8. Design a command "**wcount**" that will count the number of words in a file.
9. Design a command "**squeeze**" that will convert tabs or more than one blank space to one blank space.
10. Design a command "**replaceover**" that will replace the variable with the specified variable in a file.

**LABCYCLE II: Shell scripts and Programming**

Write Shell scripts for the following

1. Design a command **which**, that prints the path of the command (file) given as argument.
2. Design a command **search** that prints the path of the given file as argument located in your home directory.
3. Design a command **filelist [-c <char>]** which prints all filenames beginning with the character specified as argument to the command, if the option is not specified it should print all the file names.
4. Design a command **monthly-file [-m <month>]** which lists the files created in a given month where month is given as argument to the command, if the option is not specified, it lists the files in all the months.
5. Design a command **getline [-f <filename> -n <lineno>]** which prints the line number **lineno** in the file specified with **-f** option. If the line number is not specified it should list all the lines in the given file.
6. Design a command **listlines [-f <filename> -v <varname>]** which prints the line from the given file **filename**, which containing the variable **varname**. If **varname** is not specified it should list all the lines.
7. Design a command **avg [-n <column> -f <filename>]** which prints the average of the given column in a file where **column** and **filename** are arguments to the command.
8. Program which takes two file names as arguments, if their contents are same then remove the second file.

### **LABCYCLE III: File & Process Management Programming**

1. Write a C program for copy data from source file to destination file, where the file names are provided as command-line arguments.
2. Write a C program that reads every 100th byte from the file, where the file name is given as command-line argument.
3. Write a C program to display information of a given file which determines type of file and inode information, where the file name is given as command-line argument.
4. Write a C program to display information about the file system.
5. Write a C program for demonstrating dup and dup2 system calls.
6. Write a C program that prints entries in a directory.
7. Write a C program that prints files recursively in a given directory.
8. Write a C program to create a process by using fork() system call.
9. Write a C program to create an Orphan Process.
10. Write a C program to demonstrate Zombie process.
11. Write a C program to demonstrate a parent process that use wait() system call to catch child's exit code.
12. Write a C program to overlay child address space by a program, where the program name is given as command-line argument.
13. Write a C program that demonstrates both child and parent processes writes data to the same file.

### **LABCYCLE IV: Signal and IPC Programming**

1. Write a C program for requesting an alarm signal to execute user defined alarm handler.
2. Write a C program to demonstrate terminal signals (control-c & control-z).
3. Write a C program to override child termination signal by the parent process.
4. Write a C program to demonstrate Suspending and Resuming Processes.
5. Write a C program for Un-named pipes to send data from first process to the second process.
6. Write two C programs that demonstrates Named pipes, Reader and Writer Processes.
7. Write C program that demonstrates IPC through shared memory.

### **LABCYCLE V**

To implement the following Client & Server Programs using 'C' Language

1. Simple Web Server (TCP/UDP).
2. Concurrent Server (using Child Process/Threads) (TCP/UDP).
3. Simple FTP Server (TCP)

**UNIT-1**

Software & Software Engineering The nature of software, software engineering and as branch of engineering profession, stakeholders in software engineering, software quality, software engineering projects, Developing requirements Domain analysis, software project's starting point, problem definition and scope, What is requirement?, type of requirements, gathering and analyzing of requirements, requirements document types, reviewing, managing change in requirements,

**UNIT-II**

Modeling with classes UML, essentials of UML class diagrams, associations and multiplicity, generalization, instance diagrams, Using design patterns Pattern introduction, the abstraction-occurrence pattern, general hierarchical pattern, the play-role pattern, the singleton pattern, the observer pattern, the delegation pattern, the adaptor pattern, the façade pattern, the immutable pattern, the read-only interface pattern and the proxy pattern.

**UNIT-III**

Focusing on users and their tasks User-centred design, characteristics of users, developing use case models of systems, the basics of user interface design, usability principles, evaluation users interfaces

Modeling interactions and behavior

Interaction diagrams, state diagrams, activity diagrams

Architect ring and designing software

The process of design, principles leading to good design, techniques for making good design decisions, software architecture, writing a good design document

**UNIT-IV**

Testing and inspecting to ensure high quality

Basic definitions of defect, error and failure, effective and efficient testing, defects in

Ordinary and numerical algorithms, defects in timing and coordination, defects in

Handling stress and unusual situations, documentation defects, writing formal test cases

And test plans, strategies for testing large software, inspections, quality assurance in

General Managing the software process Project management, software process model,

Cost estimation, building software engineering teams, project scheduling and tracking,

Contents of a project plan

**Text Book:** Object-Oriented Software Engineering Practical software development  
Using UML and Java by Timothy C. Lethbridge & Robert Langanieri Mcgraw-Hill Co

**UNIT-I****(14 periods)****Problems, Problem Spaces and Search:**

Defining the Problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, and Issues in the Design of Search Programs.

**Heuristic Search Techniques:**

Generate-and-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.

**UNIT- II****(14 periods)****Knowledge Representation Using Predicate Logic:**

Representing Simple Facts in Logic, Representing Instance and ISA Relationships, Computable Functions and Predicates, Resolution.

**Representing Knowledge Using Rules:**

Procedural versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning, Matching, Control Knowledge.

**UNIT-III****(14 periods)****Slot – And – Filler Structures :**

Semantic Nets, Conceptual Dependency, Scripts.

**Planning:**

Overview - An Example Domain: The Blocks World, Component of Planning Systems, Goal Stack Planning, Non-linear Planning using constraint posting, Hierarchical planning, Reactive systems.

**UNIT-IV****(14 periods)****Connectionist Models:**

Introduction: Hopfield Networks, Learning in Neural Networks, Applications of Neural Networks

**Expert Systems:**

Representing and using domain knowledge, Expert system shells, Explanation, Knowledge Acquisition.

**TEXT BOOK:**

1. Elaine Rich & Kevin Knight, 'Artificial Intelligence', 2nd Edition, (TMH).

**REFERENCE BOOKS:**

1. Patrick Henry Winston, 'Artificial Intelligence', Pearson Education,
2. Stuart Russel and Peter Norvig, 'Artificial Intelligence', Pearson Education/ PHI.

**WEB REFERENCES:**

1. <https://www.ai-class.com/>
2. <https://www.ai-depot.com/Intro.html>
3. [https://en.wikipedia.org/wiki/Artificial\\_intelligence](https://en.wikipedia.org/wiki/Artificial_intelligence)

**UNIT-I****(15 Periods)**

Introduction to Big Data. What is Big Data. Why Big Data is Important. Meet Hadoop. Data. Data Storage and Analysis. Comparison with other systems. Grid Computing. A brief history of Hadoop. Apache hadoop and the Hadoop EcoSystem. Linux refresher; VMWare Installation of Hadoop.

**UNIT-II****(15 Periods)**

The design of HDFS. HDFS concepts. Command line interface to HDFS. Hadoop File systems. Interfaces. Java Interface to Hadoop. Anatomy of a file read. Anatomy of a file write. Replica placement and Coherency Model. Parallel copying with distcp, Keeping an HDFS cluster balanced.

**UNIT-III****(15 Periods)**

Introduction. Analyzing data with unix tools. Analyzing data with hadoop. Java MapReduce classes (new API). Data flow, combiner functions, Running a distributed MapReduce Job. Configuration API. Setting up the development environment. Managing configuration. Writing a unit test with MRUnit. Running a job in local job runner. Running on a cluster. Launching a job. The MapReduce WebUI.

**UNIT-IV****(15 Periods)**

Classic Mapreduce. Job submission. Job Initialization. Task Assignment. Task execution .Progress and status updates. Job Completion. Shuffle and sort on Map and reducer side. Configuration tuning. MapReduce Types. Input formats. Output formats ,Sorting. Map side and Reduce side joins. The Hive Shell. Hive services. Hive clients. The meta store. Comparison with traditional databases.

**TEXT BOOKS:**

1. Tom White, Hadoop, *"The Definitive Guide"*, 3rd Edition, O'Reilly Publications, 2012.
2. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch , *"Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data"*, McGraw-Hill Osborne Media; 1 edition, 2011

## CSE 614E      EMBEDDED SYSTEMS

**L T P M**  
**4 0 0 100**  
**(15 Periods)**

### UNIT – I

**A First Look at the Embedded Systems:** Examples of Embedded Systems (Telegraph, cordless Bar-code scanner, Laser Printer, underground tank monitor, Nuclear Reactor Monitor), Typical Hardware.

**Hardware Fundamentals:** Terminology, Gates, A few other basic considerations, Timing Diagrams, Memory.

**Advanced Hardware Fundamentals:** Micro Processors, Buses, Direct Memory Access, interrupts, other common parts, Built-ins on the Micro Processor, conventions used on the Schematics.

**Interrupts:** Micro Processor Architecture, Interrupt Basics, the shared data problem, Interrupt Latency.

### UNIT – II

**(15 Periods)**

**Survey of Software Architectures:** ROUND-ROBIN, ROUND-ROBIN with Interrupts, Function-Queue-Scheduling Architecture, Real Time Operating System Architecture, Selecting an Architecture.

**Introduction to Real Time Operating Systems:** Tasks and Task states, Tasks and data Semaphores and shared data.

### UNIT – III

**(15 Periods)**

**More Operating System Services:** Message Queues, Mail boxes and pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS environment.

**Basic Design Using a Real Time Operating System:** Overview, Principles, An Example, Encapsulating Semaphores and Queues, Hard Real Time Considerations, Saving Memory Space, Saving Power.

### UNIT – IV

**(15 Periods)**

**Embedded Software Development Tools:** Host and Target Machines, Linker/Locators for Embedded Software, Getting Embedded Software into the target System.

**Debugging Techniques:** Testing on Host Machine, Instruction Set Simulators, the *assert* macro, using Laboratory Tools.

#### **Textbooks:**

David E.Simon, 'An Embedded Software Primer', Pearson Education Asia.

#### **Reference Books:**

1. D.Gajski, F.Vahid, S.Narayan, J.Gong, 'Specification and Design of Embedded Systems', Prentice Hall of India Pvt. Ltd.,
2. Raj Kamal, 'Embedded Systems Architecture & Programming', Tata McGraw-Hill.

## CSE 615E NETWORK AND INTERNET SECURITY

L T P M  
4 0 0 100

### UNIT-I

(17 periods)

**Introduction:** The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security.

**Classical Encryption Techniques:** Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography.

**Block Ciphers and the Data Encryption Standards:** Block Cipher Principles, The Data Encryption Standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles, Multiple Encryption and Triple DES, Block Cipher modes of Operation

**Advanced Encryption Standard:** Evaluation criteria for AES, The AES cipher.

### UNIT-II

(15 periods)

**Introduction to Number Theory:** Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithm.

**Public Key and RSA:** Principles of Public –Key Cryptosystems, The RSA algorithm.

**Key Management:** Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.

**Message Authentication And Hash Function:** Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security Hash Functions, and MACs.

### UNIT-III

(14 periods)

**Hash Algorithms:** Secure Hash Algorithm, HMAC.

**Digital Signatures and Authentication Protocols:** Digital Signatures, Authentication Protocols, Digital Signature Standard.

**Authentication Applications:** Kerberos, X-509 Authentication Service.

**Electronic Mail Security:** Pretty Good Privacy (PGP).

### UNIT-IV

(14 periods)

**IP Security:** IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Key Management.

**Web Security:** Web Security Considerations, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction.

**Intruders:** Intruders, Intrusion Detection, Password Management.

**Firewalls:** Firewall Design Principles, Trusted Systems.

**Malicious Software:** Viruses and Related Threats, Virus Countermeasures

### TEXT BOOK:

1. William Stallings "Cryptography And Network Security" 4th Edition, (Pearson Education/PHI).

**REFERENCE BOOKS:**

1. Behrouz A.Forouzen, Debdeep Mukhopadhyay, "Cryptography & Network Security", 2<sup>nd</sup> Edition, TMH.
2. Chalie Kaufman, Radia Perlman, Mike Speciner, "Network Security", 2<sup>nd</sup> Edition, (PHI / Eastern Economy Edition)
3. Wade Trappe & Lawrence C.Washington, "Introduction to Cryptography with Coding Theory", 2/e, Pearson.



**UNIT - I**

**Conventional Software Management** : The waterfall model, conventional software Management performance.

**Evolution of Software Economics** : Software Economics, pragmatic software cost estimation.

**Improving Software Economics** : Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

**The old way and the new** :The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

**UNIT - II**

**Life cycle phases** :Engineering and production stages, inception, Elaboration, construction, transition phases.

**Artifacts of the process** :The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

**Model based software architectures** :A Management perspective and technical perspective.

**Work Flows of the process** :Software process workflows, Iteration workflows.

**UNIT - III**

**Checkpoints of the process** :Major mile stones, Minor Milestones, Periodic status assessments.

**Iterative Process Planning** :Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

**Project Organizations and Responsibilities** :Line-of-Business Organizations, Project organizations, evolution of Organizations.

**Process Automation** :Automation Building blocks, The Project Environment.

**UNIT - IV**

**Project Control and Process instrumentation** :The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

**Tailoring the Process** :Process discriminants.

**Future Software Project Management** :Modern Project Profiles, Next generation Software economics, modern process transitions.

**Case Study**: The command Center Processing and Display system- Replacement (CCPDS-R)

**TEXT BOOK :**

1. Software Project Management, Walker Royce: Pearson Education, 2005.

**REFERENCES :**

1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition.

2. Software Project Management, Joel Henry, Pearson Education.

3. Software Project Management in practice, PankajJalote, Pearson Education.2005.

**UNIT - I**

**Introduction to Natural Language Understanding:** Applications of Natural Language Understanding, Evaluating language Understanding Systems, The Different levels of Language Analysis.

**Syntactic Processing: Grammars and Parsing:** Grammars and Sentence Structure, Top-down parser, Bottom up chart parser, Transition network grammars, Top-down chart parsing, Finite state models and Morphological processing.

**UNIT-II**

**Features and Augmented Grammars:** Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, A Simple Grammar Using Features, Parsing with Features, Augmented Transition Networks.

**Grammars for Natural Language:** Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling Questions in Context-Free Grammars.

**Toward Efficient Parsing:** Human preferences in parsing, Encoding Uncertainty-Shift-Reduce Parsers, A Deterministic Parser.

**Ambiguity Resolution:** Statistical Methods: Part of Speech tagging, Obtaining lexical probabilities, Probabilistic Context-Free Grammars, Best-First Parsing.

**UNIT-III****Semantic Interpretation:**

**Semantics and logical Form:** Semantics and Logical Form, Word Senses and Ambiguity, The Basic Logical Form Language, Encoding Ambiguity in the Logical Form, Verbs and States in Logical Form.

**Linking Syntax and Semantics:** Semantic Interpretation and Compositionality, A Simple grammar and Lexicon with Semantic Interpretation, Prepositional Phrases and Verb Phrases.

**Ambiguity Resolution:** Selectional Restrictions, Semantic Filtering Using Selectional Restrictions, Statistical Word Sense Disambiguation.

**UNIT-IV****Context and World Knowledge:**

**Local discourse context and Reference:** Defining Local Discourse Context and Discourse Entities, A Simple Model of Anaphora Based on History Lists, pronouns and Centering, Define Descriptions.

**Using World Knowledge:** Using world knowledge: Establishing Coherence, Matching Against Expectations, Reference and Matching Expectations, Using Knowledge About Action and Casuality, Scripts: Understanding Stereotypical Situations

**Discourse Structure:** The Need for Discourse Structure, Segmentation and Cue Phrases, Discourse Structure and Reference, Relating Discourse Structure and Inference, Discourse Structure, Tense and Aspect, Managing the Attentional stack

**Text Book:**

1. James Allen, **Natural Language Understanding**, Second Edition, Pearson Education.

**Reference Books:**

1. Daniel Jurafsky, James H.Martin, **Speech and Language Processing**.
2. Christopher Manning, Hinrich Schutze, **Foundations of Statistical Natural Language Processing**, MIT Press.
3. Elaine Rich and Kevin Knight, **Artificial Intelligence**, Second Edition, Tata McGraw Hill.

**UNIT-I**

**Introduction to Network Programming:** OSI model, Unix standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application.

**Sockets :**Address structures, value – result arguments, Byte ordering and manipulation function and related functions Elementary TCP sockets – Socket, connect, bind, listen, accept, fork and exec function, concurrent servers. Close function and related function.

**UNIT-II**

**TCP client server :**Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host.

**I/O Multiplexing and socket options:** I/O Models, select function, Batch input, shutdown function, poll function, TCP Echo server, getsockopt and setsockopt functions. Socket states, Generic socket option IPV6 socket option ICMPV6 socket option IPV6 socket option and TCP socket options.

**UNIT-III**

**Elementary UDP sockets:** Introduction UDP Echo server function, lost datagram, summary of UDP example, Lack of flow control with UDP, determining outgoing interface with UDP.

**Elementary name and Address conversions:** DNS, gethost by Name function, Resolver option, Function and IPV6 support, uname function, other networking information.

**UNIT-IV****Threads:**

Introduction, Basic Thread Functions: Creation and Termination, str\_cli Function Using Threads, TCP Echo Server Using Threads, Thread-Specific Data, Web Client and Simultaneous Connections, Multexes:Mutual Exclusion, Condition Variables, Web Client and Simultaneous Connections (Continued).

**Client/Server Design Alternatives:**

Introduction, TCP Client Alternatives, TCP Test Client, TCP Iterative Server, TCP Concurrent Server, One Child per Client, TCP Preforked Server, No Locking Around accept, TCP Preforked Server, File Locking Around accept, TCP Preforked Server, Thread Locking Around accept, TCP Preforked Server, Descriptor Passing, TCP Concurrent Server, One Thread per Client, TCP Prethreaded Server, per-Thread accept, TCP Prethreaded Server, Main Thread accept.

**TEXT BOOKS:**

1. W.Richard Stevens, Bill Fenner, Andrew M. Rudoff, Unix Network Programming. The Sockets Networking API, Volume 1 , 3<sup>rd</sup> edition – 2004.

**REFERENCES:**

1. UNIX Systems Programming using C++ T CHAN, PHI.
2. UNIX for Programmers and Users, 3rd Edition Graham GLASS, King abls, Pearson Education
3. Advanced UNIX Programming 2nd Edition M. J. ROCHKIND, Pearson Education

**UNIT – I**

**Distributed System Models and Enabling Technologies:** Scalable Computing Service over The Internet ,Technologies for Network-based Computing, System Models for Distributed and Cloud Computing, Software Environments for Distributed Systems and Clouds ,Performance, Security, and Energy-Efficiency

**Computer Clusters for Scalable Parallel Computing:** Computer Clusters and MPP Architectures , Design Principles of Computer Clusters, Cluster Job and Resource Management

**UNIT - II**

**Virtual Machines and Virtualization of Clusters:** and Data centers, Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data center Automation

**Cloud Platform Architecture over Virtualized Data Centres:** Cloud Computing and Service Models. Data center Design and Interconnection Networks,Architecture Design of Compute and Storage Clouds, Public Cloud Platforms: GAE, AWS and Windows Azure, Cloud Resource Management and Exchanges, Cloud Security and Trust Management

**UNIT - III**

**Service Oriented Architectures:** Services and Service Oriented Architectures, Message-Oriented Middleware, Portals and Science Gateways , Discovery, Registries, Metadata, and Databases, Workflow in Service-Oriented Architectures,

**Cloud Programming and Software Environments:** Features of Cloud and Grid Platforms, Parallel and Distributed Programming Paradigms

**UNIT – IV**

**Cloud Programming and Software Environments:** Programming Support of Google App Engine, Amazon Web Services (AWS) Programming Microsoft Azure Programming Support, Emerging Cloud Software Environments,

**Ubiquitous Computing with Clouds and The Internet of Things:** Cloud Trend To Support Ubiquitous Computing ,Performance of Distributed Systems and Cloud, Enabling Technologies for The Internet of Things, Innovative Applications of The Internet of Things,On-Line Social and Professional Networking

**Text Book:** Distributed and Cloud Computing : Kai Hwang,G.C.Fox,J.J.Dongarra

**REFERENCE BOOKS:**

1. Cloud Computing - Web-based Applications that change the way you work and collaborate online, by Michael Miller, QUE.(UNITIV)
2. **Cloud Application Architectures** by George Reese,Published by O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA,2009.
3. **Cloud Computing and SOA Convergence in Your Enterprise - A Step-by-Step Guide**, David S. Linthicum, Addison Wesley Information Technology Series, 2010.

**UNIT – I**

Typical Real-Time applications, Hard versus Soft Real-Time systems, A reference model of Real-Time Systems.

**UNIT – II**

Commonly used approaches to Real-Time scheduling, Clock-Driven scheduling, Pros and Cons of Clock-driven scheduling.

**UNIT – III**

Priority-Driven scheduling of Periodic tasks: static assumption, Fixed-Priority versus Dynamic-Priority algorithms, Optimality of the RM and DM algorithms, Aschedulability test for Fixed-Priority tasks with short response times and arbitrary response times, sufficient chedulability conditions for the RM and DM algorithms; Scheduling Aperiodic and Sporadic jobs in priority-Driven systems: Deferrable Servers, Sporadic Servers, Constant Utilization, Total Bandwidth and weighted Fair-Queuing Servers, Scheduling of sporadic Jobs.

**UNIT – IV**

Resources and Resources Access Control, Scheduling Flexible computations and tasks with temporal distance constraints.

**Text book:**

1. Jane W.S.Liu, 'Real-Time Systems', Pearson Education Asia.

**Reference books:**

2. C.M.Krishna and Shin, 'Real-Time Systems', Tata McGraw Hill Co. Inc., 1997.

**UNIT – I**

**Introduction** – Applications – A Short History of Wireless Communications – A Market for Mobile Communications – A Simplified Reference Model.

**Wireless Transmission** – Frequencies – Signals – Antennas – Signal Propagation – Multiplexing – Modulation – Spread Spectrum.

**Medium Access Control** – Motivation for a Specialized MAC – SDMA – FDMA – TDMA – CDMA – Comparison.

**UNIT – II**

**Telecommunication Systems** – GSM, UMTS and IMT-2000

**Satellite Systems** – History, Applications, Basics (GEO, LEO, MEO), Routing, Localization, Handover.

**Broadcast Systems** – Overview, Cyclic Repetition of Data, Digital Audio Broadcasting – Digital Video Broadcasting.

**UNIT – III**

**Wireless LAN** – Infrared Vs. Radio Transmission – Infrastructure and Ad Hoc Networks – IEEE, 802.11– Bluetooth.

**Mobile Network Layer** – Mobile IP – Dynamic Host Configuration – Ad Hoc Networks.

**UNIT – IV**

**Mobile Transport Layer** – Traditional TCP – Indirect TCP – Snooping TCP – Mobile TCP – Fast Retransmit / Fast Recovery – Transmission / Time-Out Freezing – Selective Retransmission – Transaction Oriented TCP.

**Wireless Application Protocol** – Architecture – Wireless Datagram Protocol – Wireless Transport Layer Security – Wireless Transaction Protocol – Wireless Session protocol – Wireless Application Environment – Wireless Markup Language – WML Script – Wireless Telephony Application – Example Stacks with WAP.

**Textbooks:**

1. J.Schiller, *“Mobile communications”*, Addison-Wesley, 2003

**Reference Books:**

1. William Stallings, *“Wireless Communication Networks”*,

2. UWE Hansmann, LotharMerk, Martin S.Nicklous, Thomas Stober, *“Principles of Mobile Computing”*, 2nd Edition.



**CSE 622E**

**COMPILER DESIGN**

**L T P M**

**4 0 0 100**

**(14 periods)**

**UNIT- I**

**Introduction to Compiling:** Compilers – Analysis of the source program – Phases of a compiler – Cousins of the Compiler – Grouping of Phases – Compiler construction tools.

**Lexical Analysis** – Role of Lexical Analyzer – Input Buffering – Specification of Tokens-, Recognition of tokens, implementing transition diagrams, a language for specifying lexical analyzers.

**UNIT- II**

**(18 periods)**

**Syntax Analysis:** Role of the parser – Top Down parsing – Recursive Descent Parsing – Predictive Parsing – Bottom-up parsing – Shift Reduce Parsing – Operator Precedent Parsing – LR Parsers – SLR Parser – Canonical LR Parser – LALR Parser-Yacc Tool.

**Syntax – Directed Translation:** Syntax Directed definition, construction of syntax trees

**UNIT- III**

**(16 periods)**

**Intermediate Code Generation:** Intermediate languages – Declarations – Assignment Statements – Boolean Expressions – Case Statements – Back patching – Procedure calls.

**Code Generation:** Issues in the design of code generator – The target machine – Runtime Storage management – Basic Blocks and Flow Graphs – Next-use Information – A simple Code generator – DAG representation of Basic Blocks – Peephole Optimization.

**UNIT- IV**

**(16 periods)**

**Code Optimization:** Introduction– Principal Sources of Optimization – Optimization of basic Blocks – Introduction to Global Data Flow Analysis.

**Run Time Environments:** Runtime Environments – Source Language issues – Storage Organization – Storage Allocation strategies – Access to non-local names – Parameter Passing.

**Symbol Tables:** Symbol table entries, Data structures to symbol tables, representing scope information.

**TEXT BOOK:**

1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, “Compilers Principles, Techniques and Tools”, Pearson Education Asia, 2007.

**REFERENCE BOOKS:**

1. Alfred V.Aho, Jeffrey D. Ullman, ‘Principles of Compiler Design’, Narosa publishing.
2. Lex & Yacc – John R. Levine, Tony Mason, Doug Brown, O’reilly
3. Modern Compiler Implementation in C- Andrew N. Appel, Cambridge University Press.
4. Engineering a Compiler – Keith Cooper & Linda Torezon, Elsevier.
5. Compiler Construction, Kenneth C.Louden, J.J.Thomson.

**CSE 623E**

**Mobile Application Development**

**L T P M**

**4 0 0 100**

**UNIT – I**

**(15 Periods)**

**Hello, Android**

**Getting Started**

**UNIT – II**

**(15 Periods)**

**Creating Applications and Activities**

**Building User Interfaces**

**UNIT-III**

**(15 Periods)**

**Intents and Broadcast Receivers**

**Using Internet Resources**

**Files, Saving State, and Preferences**

**UNIT – IV**

**(15 Periods)**

**Databases and Content Providers**

**Working in the Background**

**TEXT BOOK:**

1. "Professional Android™ 4 Application Development", Reto Meier, John Wiley & Sons, Inc., Indianapolis, Indiana.

**REFERENCE BOOKS:**

1. "android application development a beginner's tutorial", budi kurniawan, Brainy Software.

**CSE 624E**

**DIGITAL IMAGE PROCESSING**

**L T P M**  
**4 0 0 100**

**UNIT – I**

**(10 periods)**

**Introduction:** Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System.

**Digital Image Fundamentals:** Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Some basic Relationships Between Pixels.

**UNIT – II**

**(18 periods)**

**Image Enhancement in the Spatial Domain:** Some Basic Gray Level Transformation, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing spatial Filters, Sharpening spatial Filters.

**Image Enhancement in the Frequency Domain:** Introduction to the Fourier Transform and the Frequency Domain, Smoothing frequency-domain Filters, Sharpening frequency-domain Filters, Homomorphic Filtering, Implementation.

**UNIT – III**

**(20 periods)**

**Image Restoration:** A Model of the Image Degradation/Restoration Process, Linear, Position-Invariant Degradations, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering.

**Image Compression:** Image Compression Models, Error-free Compression, Lossy Compression, Image Compression Standards.

**UNIT – IV**

**(13 periods)**

**Morphological Image Processing:** Dilation and Erosion, The Hit-or-Miss Transformation, Some basic Morphological Algorithms, Extension to Gray-Scale Images.

**Image Segmentation:** Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation.

**TEXT BOOK:**

1. Rafael C. Gonzalez, Richard E. Woods, 'Digital Image Processing' Addison Wesley Pubs (Third Edition).

**REFERENCE BOOKS:**

1. Milan Sonka, Vaclav Hlavac, Roger Boyle Image Processing. Analysis, and Machine Vision (Second Edition).
2. A.K.Jain, 'Fundamentals of Digital Image Processing' PHI.

**UNIT - I**

**Introduction:** Definition of a distributed systems, Goals, Types of Distributed systems.

**Architectures:** Architectural styles, System architectures, Architectures versus middleware, Self-Management in distributed systems.

**Processes:** Threads, Virtualization, Clients, Servers, Code Migration

**UNIT-II**

**Communication:** Remote procedure calls, Message-oriented Communication, Stream-oriented communication, Multicast communication

**Naming:** Names, Identifiers and addresses, Flat naming, Structured naming, Attribute-based naming.

**UNIT-III**

**Synchronization:** Clock Synchronization, Logical clocks, Mutual Exclusion, Global Positioning of nodes, Election algorithms.

**Consistency and Replication:** Introduction, Data-centric consistency models, Client-centric consistency Models, Replica Management, Consistency Protocols.

**UNIT-IV**

**Fault Tolerance:** Introduction to Fault tolerance, Process resilience, Reliable Client-Server communication, Reliable Group communication, Distributed commit, Recovery.

**Distributed object based systems:**

Architecture, processes, Communication, Naming, Synchronization, Consistency and replication, Fault tolerance.

**Distributed file system:** Architecture, Processes, Communication, Naming, Synchronization, Consistency and replication, Fault tolerance

**Text book:**

1. Andrew S. Tanenbaum, Maarten Van Steen "Distributed Systems: Principles and Paradigms", 2007, Pearson Education/PHI.

**Reference books:**

1. Coulouris, Dollimore, Kindberg, "Distributed Systems-Concepts and Design" 3<sup>rd</sup> edition, Pearson Education.
2. Mukesh, Singhal & Niranjana G. Shivarathri, "Advanced Concepts in Operating Systems", TMH.
3. Sinha, "Distributed Operating System - Concepts and Design", PHI.

**UNIT - I**

**Parallel Computer Models:** The state of computing, Classification of parallel computers, Multiprocessors and Multicomputers, Multivector and SIMD computers. Program and network properties: Conditions of parallelism, Data and resource Dependences, Hardware and Software parallelism, Program partitioning and scheduling, Grain Size and latency, Program flow mechanisms, Control flow versus data flow, Data flow Architecture, Demand driven mechanisms, Comparisons of flow mechanisms.

**System Interconnect Architectures:** Network properties and routing, Static interconnection Networks, Dynamic interconnection Networks, Multiprocessor system Interconnects, Hierarchical bus systems, Crossbar switch and multi-port memory, Multistage and combining network.

**UNIT-II**

**Principles of Scalable Performance:** Performance Metrics and Measures, Parallel Processing Applications, Speedup Performance Laws - Amdahl's law for fixed load, Gustafson's law for scaled problems, Memory Bounded Speedup Model.    Pipelining: Linear pipeline processor, nonlinear pipeline processor, Instruction pipeline Design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch Handling techniques, branch prediction, Arithmetic Pipeline Design, Computer Arithmetic principles, Static Arithmetic pipeline, Multifunctional arithmetic pipelines.

**UNIT -III**

**MULTI Processors:** Multiprocessor System Interconnect, Cache Coherence and Synchronization Mechanisms, Message-passing Mechanism. Scalable, MultiThreaded and Dataflow Architectures, Latency-Hiding Techniques, Principles of Multithreading, Scalable and Multithreaded Architectures.

**UNIT-IV**

Parallel Models, Languages and Compilers: Parallel Programming Models, Parallel Languages and Compilers, Dependence analysis of Data Arrays, code optimization and Scheduling, Loop parallelization and pipelining.

Text Book:

1. Kai Hwang, "Advanced Computer Architecture"; TMH.

**CSE 627E**

**BIOINFORMATICS**

**L T P M**

**4 0 0 100**

**(15 Periods)**

**UNIT – I**

**Introduction:**

Definitions, Sequencing, Molecular Biology and Bioinformatics, Biological Sequence / structure, Genomoe Projects, Pattern Recognition and prediction, Folding problem, Sequence Analysis, Homology and Analogy, Bioinformatics Applications, Central Dogma of Molecular Biology

**Information Resources:**

Biological databases, Primary Sequence databases, Protein sequence databases, Secondary databases, Protein pattern databases, and Structure classification databases DNA sequence databases, specialized genomic resources

**UNIT – II**

**(18 Periods)**

**DNA Sequence Analysis:**

Importance of DNA analysis, Gene Structure and DNA sequences, Features of DNA sequence analysis, EST (Expressed Sequence Tag) searches, Gene Hunting, Profile of a cell, EST analysis, Effects of EST data on DNA databases, The Human Genome Project

**Pair Wise Alignment Techniques:**

Database Searching, Alphabets and complexity, algorithm and programs, comparing two sequences, sub-sequences, Identity and similarity, The Dot plot, Local and Global similarity, Different alignment techniques, Scoring Matrices, Dynamic Programming, Pair wise database searching

**UNIT – III**

**(15 Periods)**

**Multiple sequence alignment & Phylogenetic Analysis:**

Definition and goal, The consensus, Computational complexity, Manual methods, Simultaneous methods, Progressive methods, Databases of Multiple alignments and searching, Applications of Multiple Sequence alignment, Phylogenetic Analysis, Methods of Phylogenetic Analysis, Tree Evaluation, Problems in Phylogenetic analysis, Tools for Phylogenetic Analysis

**Secondary database Searching:**

Importance and need of secondary database searches, secondary database structure and building a sequence search protocol

**UNIT – IV**

**(12 Periods)**

**Gene Expression and Microarrays:**

Introduction, DNA Microarrays, Clustering Gene Expression Profiles, Data Sources and tools, Applications

**Analysis Packages:**

Analysis Package structure, commercial databases, commercial software, comprehensive packages, packages specializing in DNA analysis, Intranet Packages, Internet Packages.

**Text Book:**

1. Introduction to Bioinformatics T K Attwood And D.J. Parry-Smith, Pearson
2. Bioinformatics methods and applications S.C. Rastogi, N. Mendiratta And P.Rastogi.,PHI

**Reference Books:**

1. Introduction to Bioinformatics Arthur M. Lesk OXFORD Publishers (Indian Edition)
2. Elementary Bioinformatics, Imtiyaz Alam Khan, Pharma Book Syndicate

**UNIT I****(15 Periods)**

**Multimedia Authoring and data representations:** Introduction to multimedia and hypermedia, WWW, overview of multimedia software tools.

**Multimedia Authoring and Tools:** Multimedia authoring some useful editing and authoring tools, VRML.

**Graphics and Image data representation:** Graphics/Image data types , popular file formats.

**Color in image and Video:** Color models in images, Color models in Video.

**Fundamental concepts in video:** types of video signals, analog video, digital video.

**UNIT II****(15 Periods)**

**Basics of Digital Audio:** Digitization of sound, MIDI, Quantization and transmission of audio.

**Lossless compression algorithms:** Run-length coding, Variable length coding, Dictionary based coding, Arithmetic coding, loss less image compression.

**Lossy Compression Algorithms:** Quantization, Transform coding, Wavelet based coding.

**UNIT III****(15 Periods)**

**Image compression Standards:** JPEG standard, JPEG 2000 standard, Bi-level image compression standards

**Basic Video Compression Techniques:** Introduction to video compression, Video compression based on motion compensation. Search for motion vectors, H.261, H.263

**MPEG Video Coding:** MPEG – 1 and MPEG – 2

**UNIT IV****(10 Periods)**

**Multimedia Network Communications and applications:** Quality of Multimedia data transmission, multimedia over IP, Multimedia over ATM networks

**Content Based retrieval in Digital Libraries:** Current Image search systems, C-BIRD, multimedia databases

**LEARNING RESOURCES:****TEXT BOOK:**

1. Fundamentals of multimedia, Ze-Nian Li, Mark S. Drew, Pearson education 2007.

**REFERENCE BOOKS:**

1. Multimedia Applications, Steinmetz, Naharstedt, Springer
2. Multimedia Communications, Applications, Networks, Protocols and Standards Fred Halsall, pearson education.
3. Multimedia systems design, Prabhat K. Andeliagh, Kiran Thakrar, PHI, 2007.
4. Multimedia producers Bible, Ron Goldberg, comdex computer publishing.